The Hungarian Technology Foresight Programme

INFORMATION TECHNOLOGY, TELECOMMUNICATIONS AND THE MEDIA

Panel Report

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In 1998 the National Committee for Technological Development (OMFB) launched a technology foresight programme named TEP after its Hungarian acronym. The main objective of the programme was to make a contribution to improving the long-term competitiveness of the country's economy. This would enable new opportunities to be identified in the development of both the market and technology that would improve the quality of life of the population. By analysing major changes in the economy and society as well as new achievements in science and technology, TEP defines the key issues and the areas where strategic decisions need to be made that will be crucial for the country's development in the next 15-25 years.

The Steering Group and the thematic panels have assessed the current situation, outlined different scenarios for the future, and formulated their recommendations to implement the favoured approach.

The thematic panels analysed the key aspects of the following, closely interrelated areas:

- Human resources (education and employment)
- Health and life sciences
- Information technology, telecommunications and the media
- Protection and development of the natural and built environment
- Manufacturing and business processes
- Agribusiness and food industry
- Transport

The TEP reports, analyses and findings of the Delphi survey may be accessed electronically via the home page of the Hungarian Ministry of Education at the following website address: http://www.om.hu.

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Introduction

Over the past decade revolutionary changes have occurred in Hungary in the sector analysed by the TEP's 'Information technology, telecommunications and the media' panel. The country's GDP has not grown in comparison to its 1989 level however there has been a manifold increase in the volume indicators of this sector. The components industry for the information technology, telecommunications and media sector has also experienced a major shift in technology and an extensive restructuring of the market.

The panel gave particular focus to three additional factors alongside the aspects generally analysed by technology foresight programmes. Firstly, we applied a shorter time-scale to our future scenarios than the other panels due to the extreme pace and dynamics of the changes in this sector.

Secondly, our panel occupied a special position within the TEP system. However, during the formulation of the scenarios it became clear that information technology, telecommunications and the media are closely linked and interrelated to other sectors. This finding was also supported by the responses to the Delphi survey. This sector therefore has both a vertical and horizontal dimension in the technology foresight programme (TEP).

Thirdly, we assumed that not every social group in the country would gain from the rapid development of the sector. New lifestyles and values are emerging and there will also be people who will lose as a result of these new trends in society. We therefore also took this factor into account in our work.

A Snapshot and Future Tasks

The information technology, telecommunications and media infrastructure

The infrastructure of the information society comprises four, hierarchically structured tiers: (1) telecommunications networks, systems and services; (2) computer networks, systems and services; (3) databases and content services; (4) info-communication applications.

Telecommunications networks, systems and services
During the past decade profound changes have taken place in the Hungarian telecommunications sector, the most important of which is the emergence of a supply market in place of the former market which was characterised by heavy demand The number of main telephone lines per 100 inhabitants grew from 5.8 in 1980 to 38 by

2000. (Table 1) Whereas in the past the volume of unsatisfied demand and the poor service quality had constituted the main problems in the sector, the high price of services had become the major concern by 2000. Foreign investors supported by state guarantees (concessions) provided the necessary capital for rapid development. The average annual investment in telecommunications amounted to USD 550 million between 1991 and 1995 and USD 525 million between 1995 and 2000.

Chart 1
The number of main (wired) telephone lines in Hungary between 1980 and 2000

Year	1980	1985	1990	1995	1997	1998	1999	2000
Main lines per 100 inhabitants	5.8	6.94	9.62	21.05	30.42	33.10	35.5	38.00

With regard to wired telephony, the density of main lines increased considerably during the past 20 years, especially after 1990. This was accompanied by a considerable advancement in technology in terms of the 80 per cent increase in the ratio of digital switches in telephone networks, which has occurred to date. The national high-performance backbone network had already developed by 1993 with MATAV being the dominant service provider for local telephone calls and having concessions in long distance and international services.[1] The monopoly provided by concessions will end soon which will result in a considerable intensification of market competition.

In June 1999 the National Telecommunication Authority issued the first authorisation with regard to the provision of Internet-based voice services. This was the beginning of a breakthrough in establishing Internet-based telephone services for different users which has led to price competition, primarily in relation to international calls.

The first mobile (cell) telephone service was launched in 1990 at a 450 MHz frequency in the NMT system and in 1993 two companies were awarded concessions for GSM services. The growth in service demand has exceeded even the most optimistic forecasts and the number of customers will exceed 2.8 million by the end of 2000 according to the experts' estimates.[2] The third GSM service commenced in November 1999 at the frequency of 1800 and 900 MHz.

The telex service is disappearing with a reduction of telexes in operation from 13,296 in 1992 to below 1,000 by the end of 1998.

At the beginning of the 1990s the so-called VSAT satellite data communication systems played a major role in the Hungarian telecommunication markets enabling the

[1] MATAV is the service provider in 36 of the 54 primary regions and has a 50 per cent ownership stake in the companies providing services in three additional regions. 13 local concession companies provide the services in the remaining 15 regions; these merged into three company groups by the end of 1999.
[2] This figure equates to 28 per cent of the country's population.

interconnection of information technology systems of company divisions operating at different locations. The functions of the VSAT systems are increasingly being taken over by optical cable networks in the domestic market however their role in international services will remain unchanged in the long run.

Table 1: The Hungarian telecommunications service sector compared to Europe and the country's economic performance

	Spain 1997*	Portugal 1997*	Ireland 1997*	Greece 1997*	Hungary 1990**	Hungary 1997**	Hungary June '99**	Hungary June 2000**
GDP/Capita Thousands USD	13.4	10.3	20.5	11.4	3.2	4.4	4.8	n.a.
Mobile density Per cent	10.9	15.4	14.4	5.5	0.1	7.1	13.0	20
Telephone line density per cent	39.9	39.0	42.1	51.6	9.6	31.9	33.1	38

*Source: Communication Outlook, OECD 1999 and the Hungarian Telecommunication Authority

** Source: Hungarian Central Statistical Office

The penetration (density) indicators of the telecommunications services show that Hungary had managed to address its considerable backwardness by 2000 and had caught up with the level of the lesser-developed EU countries.

The prices of wired and mobile telephone services are relatively high compared to both the international 'consumer price basket' and domestic income levels. Limited competition is just one of the reasons for this. Both the high concession fees and the powerful ability of dominant market players to assert their interests constitute major price increasing factors. In 1997 the revenues from public telecommunication services accounted for USD 2.1 billion in Hungary, 36.4 per cent of which was attributable to mobile telephony (Source: OECD). The revenue per service subscriber (customer) totalled USD 663 and mobile telephone service subscribers paid an average annual bill of USD 1090 in 1997.

The following global and local trends are anticipated in the development of technology in the sector:

- The widespread application of digital technologies, with analogue systems becoming rapidly outdated and rarely used;
- The development of global service systems;

- The convergence of technologies and services, with the boundaries between conventional services becoming increasingly indistinct;
- The rapid spread of mobile services, with mobile telecommunication and computerisation gaining a dominant role.

Computer networks, systems and services

In Hungary the development of computer networks, systems and their application in the provision of services commenced in 1986 with the launch of the Information Infrastructure Development Programme (IIDP), which subsequently became the National Information Infrastructure Development Programme (NIIDP) in 1996. Developments in the field have accelerated considerably with the rapid spread of Internet technologies in the last few years (Table 2). The 'cutting edge' functions of the research, education and public collections infrastructure play a major role worldwide in building the foundations of the information society. The fact that the Hungarian infrastructure of information technology research was developed more than a decade ago has led to excellent conditions in this field in almost every respect, even on an international standard.

Table 2: Number of computers connected to the Internet (in thousands)

Date January of the given year	World	Europe	Hungary	Hungary as compared to Europe (per cent)
1995	4,852	1,106	9	0.71
1996	9,472	2,285	18	0.79
1997	16,146	3,922	31	0.80
1998	29,670	5,942	73	1.12
1999	42,000	8,200	111	1.35

Source: Hungarian Response to the Challenges of Information Society, Office of the Prime Minister, 1999

Table 3. Indicators of selected European countries: number of computers per capita (number of registered computers/thousands of persons)

Country	1997	1998
Greece	2.5	5.3
Poland	2.5	5.0
Spain	5.0	8.2
Czech Republic	6.0	6.9

Hungary	7.0	10.9
Austria	13.7	30.7
Germany	14.3	25.7
Denmark	34.0	69.8
Finland	80.0	100.0

Source: Hungarian Response to the Challenges of Information Society, Prime Minister's Office, 1999

The computer networks in the public sector have also developed considerably during the past few years. A backbone network, built on open standards, has been developed between the institutions of central government which is able to meet current service demands in an efficient manner and possesses good quality gateways to both domestic and international public Internet networks. Computer networks are currently installed primarily in the institutions of central government and therefore also need to be extended to other levels of public administration. The two most widely used services in the government computer networks are electronic messaging (e-mails) and information browsing (on the www). The present infrastructure does not yet permit the introduction of integrated services.

The proliferation of company intranets has resulted in an increasing number of Internet users at these companies although most of these can only access the Internet from their workplace. The number of these Internet users is not recorded in the statistics as, from an Internet perspective, company intranets only comprise a few computers even if they allow several thousands of people to use the net. A representative survey carried out amongst large companies showed that 20 per cent of employees today have intranet clients that they use for e-mailing and accessing different information services. Ten per cent are able to browse the Internet's web pages and three-tenths of a per cent can access the intranet and therefore the Internet from home.

The analysis of general international trends has shown that the information infrastructure has become a strategic factor, playing a key role in all major fields of the economic and cultural development of countries and regions. The competitiveness of countries and regions will fundamentally be determined by the level of its development in the decades to come. The Hungarian High-Speed Internet2 (HIS2) pilot project proposal, which emerged as a response to the similar US and EU projects, is therefore considered to be a positive development. The objective of the project is to build a test-bed for developing new, high-speed Internet technologies and to strengthen Hungary's ability to join and fully utilise the Pan-European Internet2 by building a domestic broadband network.

Cable TV systems: Public cable TV systems started to spread in the second half of the 1980s. These, in addition to allowing homes to receive a large number of TV channels, enable the distribution of local studio productions. By using appropriate network technologies, these systems also have a two-way transmission capability (telephone and

Internet service).

The development of star-point and two-way cable systems is being promoted by the law on the media and the considerable financial support from the National Council for Radio and Television. These permit a 10 Mbit/s data transmission performance characteristic of local area networks (LAN) via the standard cable TV networks.

Databases and content services

In the past few years up-to-date databases have begun to be developed and data services have been launched in several areas of the country. As a general observation, nevertheless, we should like to point out that the country should accelerate development in this field and achieve a great deal in the near future in order to keep up with international trends.

One of the greatest challenges of the information society is the development and appropriate operation of a comprehensive data (content) service by the public administration. This service system has a fundamental effect on the conventional institutional structures of central and local government and calls for a comprehensive reform. This reform should include the way the structures are operated, the level of responsibilities, the systems of sub- and super-ordination, the relationship to the general public and the legal regulations. This service system may not be operated purely according to market conditions as these services belong to the sphere of responsibility of central and local government.

The most important tasks regarding the development of the public information system are as follows:

- Definition of the basic services and data content of state (central) and local government (municipalities);
- Definition of the tasks relating to the collection, possession, archiving and verification of data;
- Formulation of the principles of and pre-requisites for the commercial utilisation of databases developed by the state and municipalities;
- Clarification of the legal, technical and financial principles of accessing public information;
- Clarification of the problems regarding data protection, data security and personality rights.

The formulation and codification of new laws on constitutional, public and civil rights and obligations is required to achieve the above aims which may have a fundamental effect on the operation of the public administration sector. The range of data to be provided by the state and local government is an example of one of the critical issues. Decisions should be made on the so-called universal data service in terms of how to secure data quality (authenticity, integrity and actuality) and how to regulate possession,

usage, utilisation and disposal rights.

The so-called information (reference) databases support business activities on the one hand and on the other provide assistance to citizens in resolving their everyday problems (for example, financial and stock exchange information, data on consumer products – e.g. characteristics, prices and quality – information on shipping services, weather forecasts, public transport information, job advertisements etc.)

The development of reference databases and the associated services has also commenced in Hungary as a result of the spread of Internet technologies. Almost every major business entity, civil organisation, service institution, central and local government institution in the country has its own Internet homepage. The number of reference databases will expand in proportion to the rapid growth in the number of Internet-connected servers.

There are, however, a number of regulatory problems to be solved in this sector. These include ethical questions regarding information content, the protection of public and private interests, human rights, intellectual property rights and consumers' interests as well as establishing proper conditions for fair competition, data protection and data security and the formulation of rules regarding secrecy and encoding for electronic transactions.

The probable transformation of media-type content services will significantly change the way we spend our entertainment and leisure time. The role of the electronic media is most likely to increase and the mass entertainment technologies based on network communication will spread. The significance of network-based personal interaction will grow and the traditional means of communication will re-appear in new forms. News items will generally appear in digital form and there will be widespread access to multimedia- and server-based, shared information management, information archiving and information transmission technologies and services. The possibility of interaction will increase and the above changes will restructure the inter-relationship between the media and society, the media and politics and finally between politics and society. Furthermore, new types of communities and associations will result from these changes with the advent of new forces that drive society.

Some of the media-type services are already available in Hungary however the volume of entertainment materials in Hungarian is limited and there are unresolved problems concerning the legal and ethical aspects of these services. We will have to deal with a number of professional and policy issues in these fields in the forthcoming years at the same time as the new European guidelines and recommendations are applied.

Large application systems based on information technologies

The large application systems providing complex services for society, the economy and the public administration institutions constitute the top tier of the information society infrastructure. The information technology applications are very diverse and we will

therefore only deal with those likely to play a dominant role in the information society. The common characteristics of large application systems are as follows. They use information technologies in an integrated way, they change the method of organisation and operation in a fundamental way in the areas in which they are applied, they bring about new systems of values and forms of behaviour and lead to profound changes in the relationship between people and organisations.

Information technologies of the participative democracy: The development of information technology and its application in everyday life provides new dimensions in the relationship between the state/local government administration and the people. New types of interaction may be developed within these new frameworks between central and local government administrations and other stakeholders in society and the mechanisms of decision-making are also restructured. A number of legal and technical problems must be resolved in conjunction with central and local government and other social organisations in order to establish favourable conditions for participative democracy in Hungary.

State and municipality provide informatics services: The main state-provided services may be described in brief by four, closely interrelated functions. The state (1) acts as a major user of information technologies; (2) provides socio-economic conditions that aid competitiveness on a national and international basis; (3) promotes the principles of equal opportunity in both personal and regional terms; (4) actively supports the development of the information society and the establishment of its institutional structure.

Despite the widespread conservatism that prevails in the country's public administration, certain results have been achieved over the past few years in respect of the development of a 'service providing state' which has an increased reliance on information and network technologies. The development of the telecommunications, computer networks, systems and services of central government, the public administration, the law enforcement sector and the municipalities constitute a pre-requisite for further advancement. It means strengthening the basic information technology infrastructure of the country by applying common standards, principles, a well-devised strategy and by securing the necessary financial resources for development.

Education/training: Only an education system which is subjected to profound reorganisation in respect of its structure and content will be able to meet the challenges of the new age that is unfolding, the intensifying market competition and the information society. The country's education system should be harmonised with the labour market and the demands of the market in general. Furthermore, education should become more adaptable to the rapidly changing social needs.

In the years to come we must introduce far-reaching reforms within the education system. The development of information technologies providing a basic infrastructure for education will bring about new opportunities but will also demand new skills and knowledge. It is likely that the lifecycle of knowledge will shorten and the volume of accessible information will increase dramatically (accompanied by an increasing danger

of information technology 'environmental pollution'). The need for education, training and continuous learning will grow in society, as will people's expectations of them. This process will cause increasing tensions between the traditional elite training and the new forms of mass education. Preserving the true intellectual values and key elements of the traditional educational and scientific research structures will also become a real challenge. Certain social groups will face the danger of 'being left behind' if the education system does not become broad-based and this may result in new dimensions of social tensions and polarisation (increasing poverty, crime, ethnic and regional disparities).

Electronic commerce: In terms of the application of advanced electronic technologies to traditional market processes, electronic commerce simplifies and accelerates economic transactions whilst completely restructuring the traditional forms and methods of commerce. It establishes new types of links between the market players and changes the shopping habits of institutions and individuals, therefore affecting almost all areas of social and economic life.

Electronic commerce is advancing very rapidly in the developed countries of the world although Hungary has only made initial steps into this field. Multinational companies use the most advanced systems in the country, mainly for inter-company trading. The relative backwardness of the small and medium-sized indigenous enterprises is however striking. The first steps have already been taken in this regard in the country's retail trade but the legal, technical and social conditions for the widespread use of such services are as yet inadequate. We must build a social environment backed by legal guarantees and mutual trust that will lay the foundations for a wide-scale acceptance and use of electronic commerce. The enactment of the law regarding electronic signatures in early 2001 will be a major step forward in this regard.

Information technology in the healthcare sector: The widespread use of advanced info-communication technologies aids the improvement in the quality of life and life expectancy of the population. The application of electronic devices in healthcare brings about fundamental changes in regard to the prevention of illness, diagnostics, therapy and rehabilitation.

The major tasks involved in the development of information technology systems for healthcare include the establishment of an integrated hospital information technology system, the provision of information technology support for basic healthcare services, the development of widely accessible healthcare information services for the population, the improvement of services in tele-medicine and emergency care and the development of national healthcare databases. The above developments and changes have only been initiated in a few areas in Hungary.

Other important application areas of advanced information technology systems which are not mentioned here include environmental protection, geographic information systems (GIS), law enforcement, transportation and postal services. A concept for intelligent urban settlements should also be introduced in practice, primarily to aid the catching up process of underdeveloped regions. The institutions involved with the preservation of national cultural heritage are potential users of large-scale information

technology systems and computer networks may also be developed for public collections (archives, libraries and museums).

The components industry (suppliers' network) for information technology, telecommunications and the media

The Hungarian telecommunications industry had already earned a good reputation and established strong market positions in this field by the beginning of the 20th century. It also remained a driving force of the country during the years of the centrally planned economy. However the products of these domestic companies were manufactured primarily from imported components with low-efficiency processes and were only marketable in the Eastern and Central European region.

With the advent of the liberalised domestic market in 1990 the indigenous companies manufacturing traditional telecommunications hardware devices based on domestic research and development proved to be uncompetitive. Large companies ceased production (e.g. BHG, ORION, Telephone Company, Videoton, EMV, BRG, EMG and FMV). These companies were bought up by new owners and/or changed their production profile. A number of new enterprises were established as a result of greenfield investments (e.g. IBM, Philips, NOKIA, and ERICSSON) and this industrial sector has again emerged as an engine of the country's economy.

The majority of R&D activities are carried out in software or application-oriented org-ware development owing to the characteristics of information technologies. The country has a strong knowledge and skills base in these fields (software and org-ware development) and large companies are able to find a skilled R&D workforce to establish their software development laboratories in the country. During the 1980s several Hungarian software developers worked for the above companies on a contract basis in Hungary or at development centres in the West. Since then both SIEMENS and ERICSSON have established their own software development centres in Hungary. NOKIA is also in the process of building its research centre in Hungary and is recruiting well-educated Hungarian researchers and engineers. This company also carries out research and development work on the software products used in mobile telephone systems. One short-term goal is also to reinforce Hungary's research capacities to carry out software development work for other industrial sectors. One of the most recent developments is a contract signed between MOTOROLA and the Computer and Automation Research Institute of the Hungarian Academy of Sciences (MTA-SZTAKI) regarding joint work in the field of software quality control and application.

Changes in the regulatory environment

The first major step of the changes at the beginning of 1990 involved the separation of the telecommunications, postal service and broadcasting activities. The new laws on concessions (1991), telecommunications (1992), use of frequencies (1993) and the media (1996) set new frameworks for the operation of business.

Nevertheless, the role of the state has not as yet been fully developed in the gradually liberalising market of Hungarian telecommunications, for example in terms of the form and methods of intervention. In the European Union it is generally understood that the state may not act simultaneously as owner and market regulator. The role of regulations has increased in importance as a result of the liberalisation of the market. The efficient management of resources, the protection of national interests, the clarification of the rules and conditions of market competition, the protection of consumers' interests and the settlement of disputes occurring between the different players in the market all call for well-devised and consistently enforced regulations. State ownership should be relinquished in the sector if the regulatory and controlling authorities fall under the direct influence of the state. If it is more feasible to maintain state ownership in the sector then independent regulatory and controlling authorities should be established. There are examples of both cases in the EU member countries. It is no accident that the role of the state has a particular focus in both our snapshot assessment and the scenarios of the future.

The short-term tasks regarding regulation are as follows:

- The formulation of a comprehensive national strategy and development policy for telecommunications and information technology, including passing relevant laws and regulations;
- Stimulating the information technology, telecommunications and media market (e.g. deregulation, harmonisation of regulations, the launch of state development projects, the introduction of special tax and duty breaks, new measures regarding investments and export support, increased support for info-communication R&D);
- The protection of public interests (e.g. assisting price reductions in information technology services, the protection of customers' interests and the regulation of competition);
- The protection of human and personality rights (e.g. rights of possessing, managing, accessing and utilising information, copyrights, freedom of speech, the protection of general human and personality rights, the formulation of regulations and guidelines on interconnecting databases);
- New regulations on content (protection of human dignity, ways and means of classifying content etc.);
- Increasing the security and efficiency of electronic transactions (e.g. encoding, authentication, data protection and regulating electronic commerce);
- The passing of laws meeting the new challenges arising from the changes in the relationship between employers and employees and the regulation of 'remote-activities'.

Future Scenarios

Methodology

The first step in the process of formulating scenarios is to define the variables, the state of which determines a respective scenario. The panel has decided to choose as variables the major sector-specific factors which most strongly characterise the future changes in the given sector and which show most clearly the differences between the possible future scenarios. We only defined two different states of these variables (namely binary variables, their scores being +/- or 0/1).

The choice of the role of the state as a variable caused the most intensive debates within the panel and amongst the experts taking part in the TEP exercise and two strongly opposing views emerged. The first view was that the weakening role of central government was one of the major trends developing in advanced democracies accompanied by the intensification of the activities of professional, business and civil groups. According to the other view, identifying adequate responses to the present challenges would require a stronger regulatory role on the part of the state, the public administration and legislative bodies. The traditional methods of operation and value system of society may change to such an extent in the future that a fundamentally new regulatory framework would be required. The latter view prevailed in the panel with the majority opinion being that timely and professionally well-founded solutions to central and local regulatory problems were one of the keys to the development of a small country in the process of catching up.

The sector's future scenarios have been outlined along three variables:

- The impact of the world economy on Hungary;
- The extent of the convergence of telecommunications, information and media technologies;
- The role played by the state.

Eight theoretically possible scenarios emerged which were defined by the three variables. The panel only carried out in-depth analyses of the ones which were characteristically different from one another and also appeared to be feasible. Consequently the panel chose three scenarios that justified further elaboration and proceeded to define and formulate each of the following future scenarios, giving each the 'symbol' of an animal:

- 'Small tiger' scenario - active strategy
- 'Sparrow-hawk' scenario - defencelessly drifting
- 'Dinosaur' scenario - passive strategy

Scenarios

The respective scenarios are described hereafter. The analyses took into account the external and internal conditions of the country, the social impacts and the major crossroads occurring along the course of development of the given scenario.

The 'Small tiger' scenario may only be realised if the positive trends in the areas of all the three variables all occur simultaneously. The 'Sparrow-hawk' and the 'Dinosaur' scenarios are instructive and useful as they call attention to certain 'crossroads' and decision-making points where delays or inadequate decisions may lead to a course of disadvantageous social and economic development.

'Small tiger' scenario (active strategy)

The most important characteristics of the scenario as follows:

- The development of telecommunications, information technology and the media is stable and balanced in every respect. Market and technology convergence is a major driving force of development;
- The dynamic and advantageous trends prevailing in the world economy also have positive impacts in Hungary;
- The state actively contributes to the development of market forces and conditions.

This scenario sees the complete restructuring of the traditional methods and services within telecommunications, information technology and the media in Hungary during the next decade. The integrated communication technologies based on the advanced versions of the Internet gradually absorb other, traditionally separate professional fields. The 'all-knowing network' constitutes the basis of interaction of the people and their entertainment as well as of electronic commerce and financial transactions. The Net also serves as a tool for education and work and the accessibility of the Net becomes a basic condition of social and economic existence.

The state plays an active role in the advancement of the information society by regulating market conditions and prices, facilitating the increase of economic efficiency, providing guarantees for the protection of public interests (for example, through consumer protection regulations), optimising the use of limited resources, protecting national interests in international harmonisation, acting as a major information user and service provider and supporting innovation.

Hungary becomes an integral part of the European Union and is able to use its membership as an advantage for the country.
According to this scenario, Hungary has good chances of playing a strong, regional role in Central and Eastern Europe on the basis of our participation in the European telecommunication associations and organisations.

The info-communication sector becomes a major value-adding player in the economy as a result of the rapid development of the information and telecommunications technologies. This has a positive impact on the development of society as a whole as information disseminated through integrated info-communication systems and networks

helps both organisations and individuals to locate and exploit new economic and social opportunities as well as making a direct contribution to the improvement of economic performance.
In this scenario the state actively supports education and the spread of emerging technologies and services. In implementing the above the state is able to adequately define the rights and obligations of the state administration institutions in both their roles as information providers and information users. Appropriate regulation and control of info-communication technologies and tools is exercised. The info-communication technologies improve the efficiency of the public administration and an increasing level of trust in the state institutions emerges on the part of society.

The convergence of technologies also offers opportunities for the country to break out of old moulds. The country's telecommunications research and development activities are seen to be strong in the region. The Central and Eastern European region is significant for the European Union not only as a market but also as a source of well-trained labour. However our R&D capacities need to be improved in order that we may adapt new information and telecommunication technologies to domestic needs and locate new potential markets for Hungarian products and services.

In summary, fierce competition and a continuously and dynamically changing environment result from the convergence of information, telecommunications, broadcasting and consumer electronics technologies as well as the intensifying division of labour and the emergence of global services. These trends may play a part in putting the Hungarian economy and society on a long-term development course subject to the existence of an active strategy and government participation.

'Sparrow hawk' scenario (defencelessly drifting)

The basic assumptions of this scenario are as follows::

- The development of telecommunications, information technology and the media is stable and balanced in every respect. Market and technology convergence are major driving forces of development;
- Foreign influence is very strong in the sector and also in the economy as a whole. The world economy is dominated by trends towards globalisation and their impacts on Hungary are significant.
- The state remains passive in the development of the driving forces of the market and generally plays a weak role in the advancement of the sector.

The most important characteristic of this scenario is that large international companies dominate the domestic market due to the minimal role of the state.

Trends towards convergence prevail in most of the important areas of technological, economic and social development. The development and spread of digital technologies lead to the continuous amalgamation of formerly separate technologies and manufacturing activities. Convergence is achieved in the sector and the previously separate industries (and companies) in the telecommunications, information technology and media fields are integrated in the 'digital melting pot'. The above trends also result in a convergence and concentration process with regard to services leading to an even

lesser number of market players providing the various services.

The most powerful economic players determine and shape the socio-economic changes and trends in the country due to the weak role of the state. The state is unwilling (or unable) to influence economic trends by either regulatory means or by allocating central resources to the sector. (In an extreme case, the state is even unable to prevent the domination of the market by monopolies).

The significantly limited role of the state also means that the government administration will not be a major information user on the market. The state does not support research and development to an appropriate extent and also does not allocate central resources to developing and maintaining the digital content services which are of strategic importance for the preservation of our national cultural heritage. The state withdraws from services that currently come within its area of authority and responsibility (e.g. maintaining registries on real estate, housing, motor vehicles and enterprises).

International monopolies emerging from the different convergence trends also become dominant participants in the Hungarian market. This endangers the preservation of local values and national cultural traditions as the indigenous participants in the economy are only able to seize a few marginal segments of the domestic market.

The well-educated labour force finds or locates many new employment opportunities however primarily in the form of part-time jobs or distant work which do not provide sufficient employment security. The opportunities for less educated people are limited. The employment rate is high in areas where the infrastructure is well developed while an increase in unemployment is apparent in regions with an underdeveloped infrastructure. Cultural isolation may weaken in theory but the potential opportunities of the information society are only exploited to a limited extent in the country due to the lack of sufficient content services in Hungarian. The cultural gaps within the country widen as a result of the absence of a well-targeted education policy and support programmes for disadvantaged social groups.

In summary this scenario sees the differences between regions increasing as the majority of small settlements become unable to harvest the opportunities provided by the info-communication technologies and tools. The weak state does not (is not able to) play a visibly compensatory role. The emergence of ‘normal’ monopolies puts many regions in a vulnerable position. A large number of innovation opportunities will not be realised in the absence of a targeted government incubation policy, particularly in the regions that traditionally lack capital.

‘Dinosaur’ scenario (a passive strategy)

The basic assumptions of the scenario are as follows:

- The above rapid development and convergence of information, telecommunications and media technologies does not occur in Hungary. This may be as a result of state interventions that act as a damper, preventing the otherwise organic trends of technological development. The current industrial

sectors and technologies remain separate.

- The global trends determining the development of the world economy have almost no impact in Hungary. In these circumstances Hungary is isolated from the global trends of technological and economic development.
- The state remains passive in the development of the driving forces of the market and generally plays a weak role in the enhancement of the sector.

The above situation and conditions may occur for several reasons:

- Hungary embarks upon a development path of political and economic isolation, which also leads to technological isolation.
- Policy-making and decision-making become heavily centralised with the central government administration being unable to cope with the mass of pressing duties and tasks. Consequently, the role of the state weakens and the decisions and actions required for a balanced development are not taken.
- Unexpected difficulties occur in technology development (for example, data transmission performance increases more slowly than required by either necessity or demand or the huge data mass stored on the world net triggers a 'complexity explosion')
- The conservatism of users: people disappointed by the often artificially generated needs and 'extras' become satisfied with the level of service achieved so far. Large number of customers does not consider the new, improved services offered by the converged technologies attractive enough to invest extra money in these in the hope of future benefits. Public opinion is not positive on the opportunities brought about by the information society and there is even a common conviction regarding its negative impacts.
- Movements opposing the information society and forces rejecting development have a strong influence in the country. The previously established monopolies are not interested in converging technologies and are in a position to prevent (or significantly hamper) advancement in the absence of efficient state intervention and regulations.

The basic characteristics of this scenario are as follows: the slow-down of technological development, the postponement or only partial realisation of convergence and the economic and political isolation of the country. In addition, the weak role played by the state is unable to compensate for the development gap resulting from the lack of technology advancement. The positive trends and aspects of globalisation also have a limited impact on the country.

The postponement of convergence trends in info-communication technologies and services and the economic and technological isolation of the country may have the following consequences:

- The country generally misses out on all the positive effects offered by the revolutionary advancement of info-communication technologies. The competitiveness of the economy weakens, the country becomes isolated from the major international trends and the EU integration process stalls.
- The growth of the economy slows down, the economic and technological gap

increases and the country is integrated into the international division of labour on a weak basis.

- The conditions required for price-reducing competition are not created either in the services or in the manufacture of equipment. The lack of competition calls for stronger needs with regard to regulations however the weak or over-centralised state is unable to cope with its regulatory role.
- Only a few players in the domestic economy are able to take advantage of the global convergence opportunities occurring in the sector and the advantages enjoyed by different participants vary considerably. The organisations and players in the sector are characterised by autarchy and isolation and the level or interaction between them is low.
- The media advances along the traditional course of development and interactive, intelligent technologies and tools are not widely used.

Conclusions and Recommendations

1. Information technology, telecommunications and the media, as high-tech industries, are the engines of economic development. These technologies provide tools that have overlapping effects in the economy and this has already been supported by TEP's findings on the links and interrelations between the different sectors.
2. Sustainable development may only be achieved through an efficient exploitation of opportunities brought about by the information revolution.
3. The bottleneck present in the development of the information society is not constituted by the lack of financial resources or technological abilities but by the low level of absorption capacity amongst people or the social readiness for new technologies.
4. The knowledge and skills accumulated in the telecommunications sector may be used in other, closely related sectors and areas (e.g. transport).
5. The sectors covered by the panel should conduct intensive public relations and information dissemination activities. This conclusion is supported on the one hand by the findings of the Delphi survey which showed that the views and opinions of professionals working as users in closely related professional areas were considerably different from those of the professionals in the field. On the other hand, we have to counterbalance the effects of 'pseudo-sciences' whose representatives often make headline news in a media that sometimes treats the 'apostles of alternative science' as media stars in their hunt for sensationalism.
6. There is a need for the state to take an active role in information technology, telecommunications and the media. The main role of the state should be to aid and encourage the development of the sector by governmental means (policies, financial support etc.). In this context it would also be useful to formulate and introduce a market regulatory framework that conforms to EU standards. It is also a task of the government to ensure that revenues from privatisation and concessions in the fields of information technology, telecommunications and the media are not only used to fund the budget deficit but are also invested in the development of the given sectors.

7. Responsibilities of the state

- The preparation and implementation of legal and regulatory harmonisation in the fields of electronics, telecommunications and the media. This is required to aid the EU accession process and should include regulations on services, market players, conditions of competition, data and content services and data protection and security. A harmonised legal environment should be created that encourages market competition, reduces the prices of telecommunications services, improves the quality of services and promotes technological development.
- The formulation of a comprehensive law on information technology, telecommunications and the media involving a broad base of professional and civil organisations.
- Establishing the legal conditions and practical tools for participative democracy and the general creation of institutionalised frameworks and procedures enabling citizens to take part in everyday political life using the opportunities offered by new technologies and tools.
- The maintenance and continuous upgrading of the state data assets of large, state-owned databases, the formulation of rules and principles to use, access and commercialise state data assets, the definition of procedures for data management and the clarification of the rules concerning data security and personality rights.
- The creation of a model for state services with regard to the accessibility of databases for the public, electronic administration and, in general, the development of state-operated information service systems for the public.
- The development of information technology systems for healthcare and the definition of guidelines and recommendations to efficiently exploit the new opportunities provided by the advancement of information technology, telecommunications and the media.
- The formulation of a new education strategy for the information society including the necessary changes in the content of education, the directives regarding financial support for different schools (elementary, secondary and tertiary educational institutions), training/retraining and changes of profession. The definition of the basic information technology criteria, user skills and professional knowledge to be included in curricula and performance standards is required at all levels and forms of education.
- The creation of new legal frameworks suited to the new labour culture of the information society, the support for disadvantaged social groups and the handling of the problems of unemployment.
- Establishing new principles and preferred methods of funding scientific research, providing increased support for scientific research related to information technology and telecommunications as well as for research on the information society carried out by social scientists.
- Support for the leisure time activities of the citizens by preserving and promoting cultural heritage and creating wide opportunities for electronic access to museums, libraries and other public collections.
- Technologically upgrading the public media by introducing new tools for the

production, transmission and broadcasting of programmes.

- The development and operation of advanced information technology systems for the public administration, law enforcement institutions and the armed forces. (The latter should also meet NATO requirements).
- The development of the information technology systems of environmental protection and agriculture and the establishment of domestic registry systems for real estate and public works.
- The launch of national 'campaigns' to popularise the advantages and opportunities of the information society and to increase society's readiness for it.
- The introduction of new tax and duty regulations facilitating the spread of info-communication technologies and tools, especially in non-profit making areas.

8. Economic tasks (to be solved in collaboration between the state and the market participants)

- Formulating a comprehensive economic development and industrial development strategy for the information age, taking account of the future roles of the state and enterprises as well as those of multinational companies and the domestic capital market.
- Securing adequate financial resources to support the national information strategy, mobilising both public and private resources.
- Developing high-performance networks for e-commerce based on market principles.

9. Tasks to be solved in collaboration between society and the state

- Launching and supporting initiatives by civil groups and other organisations to respond appropriately to the challenges of the information society (e.g. to reduce psychological, mental and other problems experienced by people, along with unjustified fears in society).
- Introducing new initiatives by government, civil and private institutions to disseminate information on the new opportunities offered by the information society concerning, for example, the creation of new jobs and new ways and forms of spending leisure time (entertainment).
- Involving civil organisations and private enterprises in the formulation and implementation of the national information strategy.
- Formulating ethical principles for the information society and the creation of codes of ethics for the new 'dimensions' and activities.
- Managing problems and reducing tensions arising from the change in lifestyles and the emergence of new forms of human interaction.
- Responding to the challenges and opportunities of globalisation with a particular focus on the preservation of the national cultural heritage and language.
- Establishing new civil organisations to help to identify and resolve the problems regarding legal rights and the protection of interests and personality resulting from the changing relationship between society and individuals.

10. Tasks regarding development of the infrastructure (to be shared and solved by the private sector and the government)

- Developing the telecommunications infrastructure and the rapid introduction and dissemination of new, advanced technologies and tools.
- Developing the computer system and network infrastructure with a particular focus on broadband networking technologies, network servers and increasing the number of users.
- Developing content services in terms of the building of large databases and securing wide-scale access to these.
- Developing information technology applications in terms of advancing the systems of electronic media and entertainment as well as electronic commerce. This will create opportunities for the widespread application of information technologies and tools in different areas of the economy and society.